

Microfabricated Millimeter-Wave Antenna Arrays, Phase II

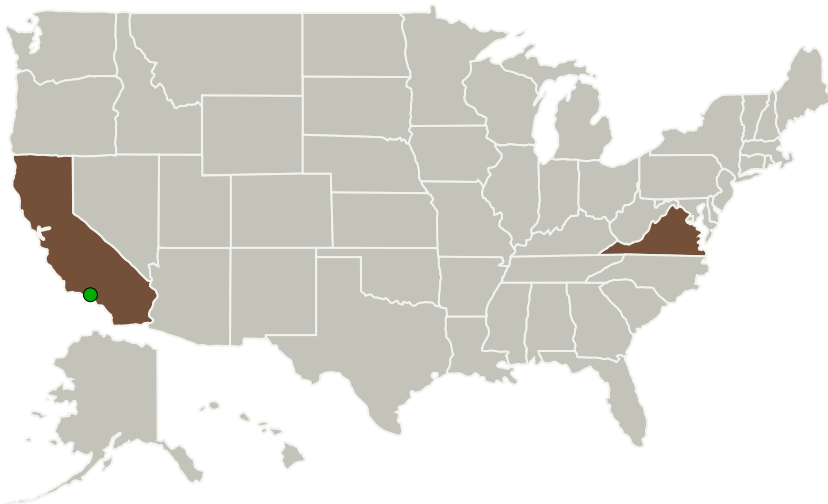
Completed Technology Project (2010 - 2012)



Project Introduction

This proposal addresses the need for an antenna technology platform that meets the requirements of high-performance materials, exacting dimensional tolerances, and the geometrical design freedom to enable planar antenna array technologies for frequencies greater than 90GHz. The PolyStrata fabrication technology, being developed at Nuvotronics, LCC, Blacksburg, VA., is capable of meeting or exceeding all of the requirements outlined to be a solution for these frequencies. Air-filled copper rectangular coaxial transmission lines are fabricated using a photolithographically defined layer-by-layer process. The resulting transmission lines are extremely broadband, low-dispersion, high-isolation, and low loss compared to other forms of planar transmission lines. These lines are smaller than rectangular waveguides because the transverse cross-sections of the lines are not resonant. Phase II of this work will include the design, fabrication and characterization of prototypes that will enable PolyStrata-based frequency-scanned antenna-array operating from 140-160GHz with +/-16 degree beam steering, a beamwidth of 0.5 degrees and 400MHz per beam bandwidth. An antenna array with this performance would require roughly 24cm by 24cm. This is possible using 4 sub-arrays that each are fabricated on a single wafer and then tied together to achieve the overall system performance. We will develop and deliver prototypes that will be smaller versions of this, but demonstrate all the necessary aspects of the system including the feed network, the antennas, the tiling of subarrays and the connection to the outside world. The approach will offer a high-yield, cost effective product that will meet the NASA needs.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Nuvotronics, Inc	Lead Organization	Industry	Radford, Virginia
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Virginia

Project Transitions

**March 2010:** Project Start**June 2012:** Closed out**Closeout Summary:** Microfabricated Millimeter-Wave Antenna Arrays, Phase II Project Image**Closeout Documentation:**

- Final Summary Chart Image(<https://techport.nasa.gov/file/139220>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Nuvotronics, Inc

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

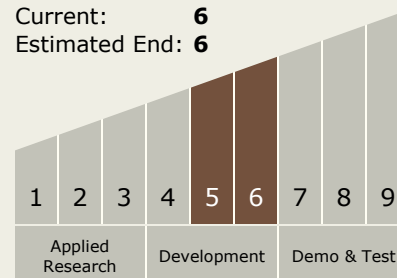
Carlos Torrez

Principal Investigator:

Kenneth J Vanhille

Technology Maturity (TRL)

Start: 5
Current: 6
Estimated End: 6



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Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.2 Observatories
 - └ TX08.2.2 Structures and Antennas

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System